



**‘WHAT YOU NEED TO KNOW TO EARN MORE IN
SYSTEM ADMINISTRATION AND SECURITY’**

THE MOST COMPREHENSIVE GLOBAL IT SALARY AND SKILLS SURVEY EVER.

SKILL UP

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For companies and people all over the world Security and System Administration have become even more essential over the last few years, and for you, as a System Administrator, there are a few important decisions that can affect your entire career. You need to ask yourself questions such as:

- How is Big Data going affect you and your role? Do you need additional skills?
- Should you join a start-up, or go into an enterprise company?
- What skills do you need to keep up within an ever-changing environment?
- Which new technologies are in use the most?

The need to answer these questions led us to look at the community as a whole, and so we decided to launch our Skill Up campaign.

WHAT IS SKILL UP?

With our Skill Up survey we wanted to look at the tech community as a whole to identify upcoming trends over the next few years and share what you can do to ensure you get the most out of your career and skills. We divided our survey into 4 segments, Web Development & Design, Application Development, Security & System Administration, and Data Science & Business Intelligence. With over 20,000 responses, this is one of the most comprehensive surveys in recent years.

Specifically we asked:

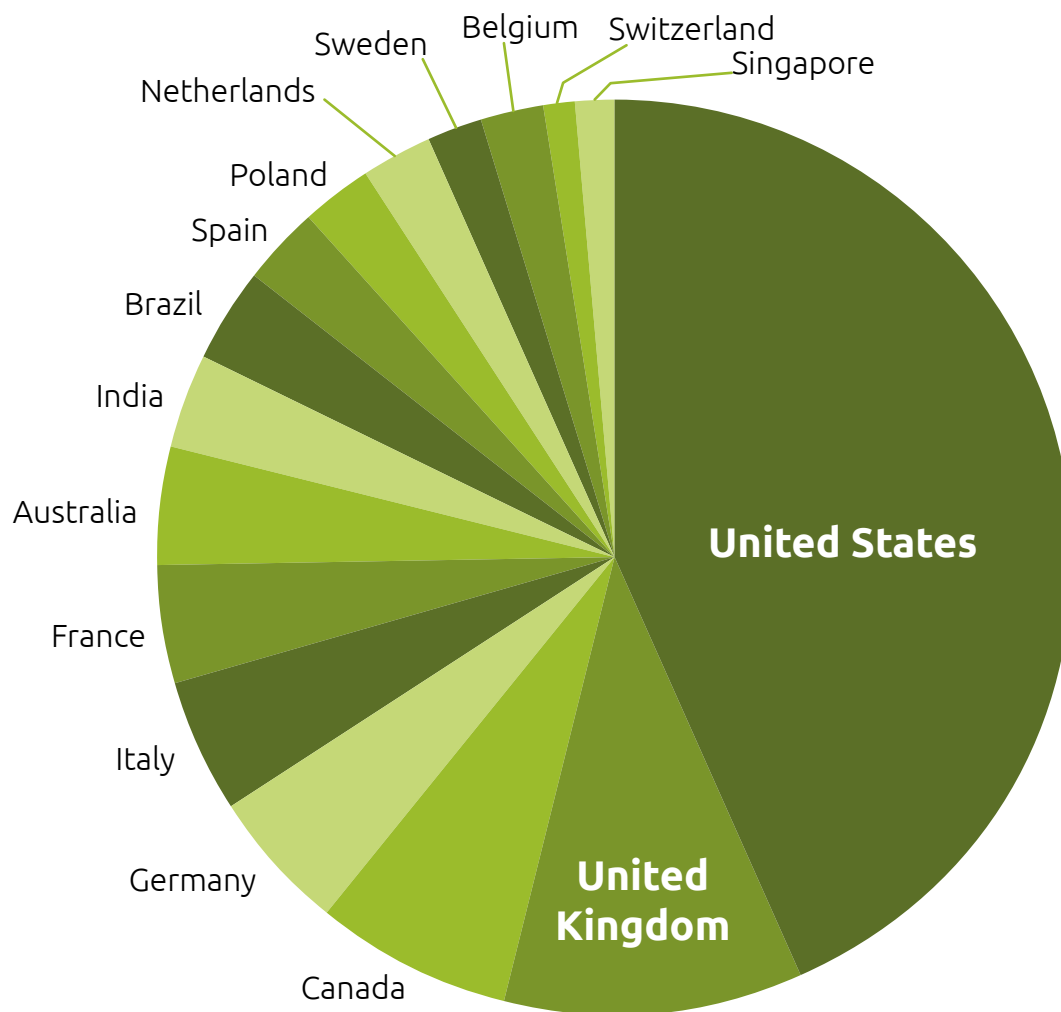
- What skills lead to a higher salary?
- What skills/technologies are most highly valued by different industries?
- What cutting edge technologies are really worth you spending your time learning?

To get a better idea of the community's thoughts we asked you all to fill in our survey, the results of which you can find compiled here in this report, giving you the facts, the figures, and more importantly – the knowledge and skills you need to make the best career decisions.

Let's look at the results in more detail.

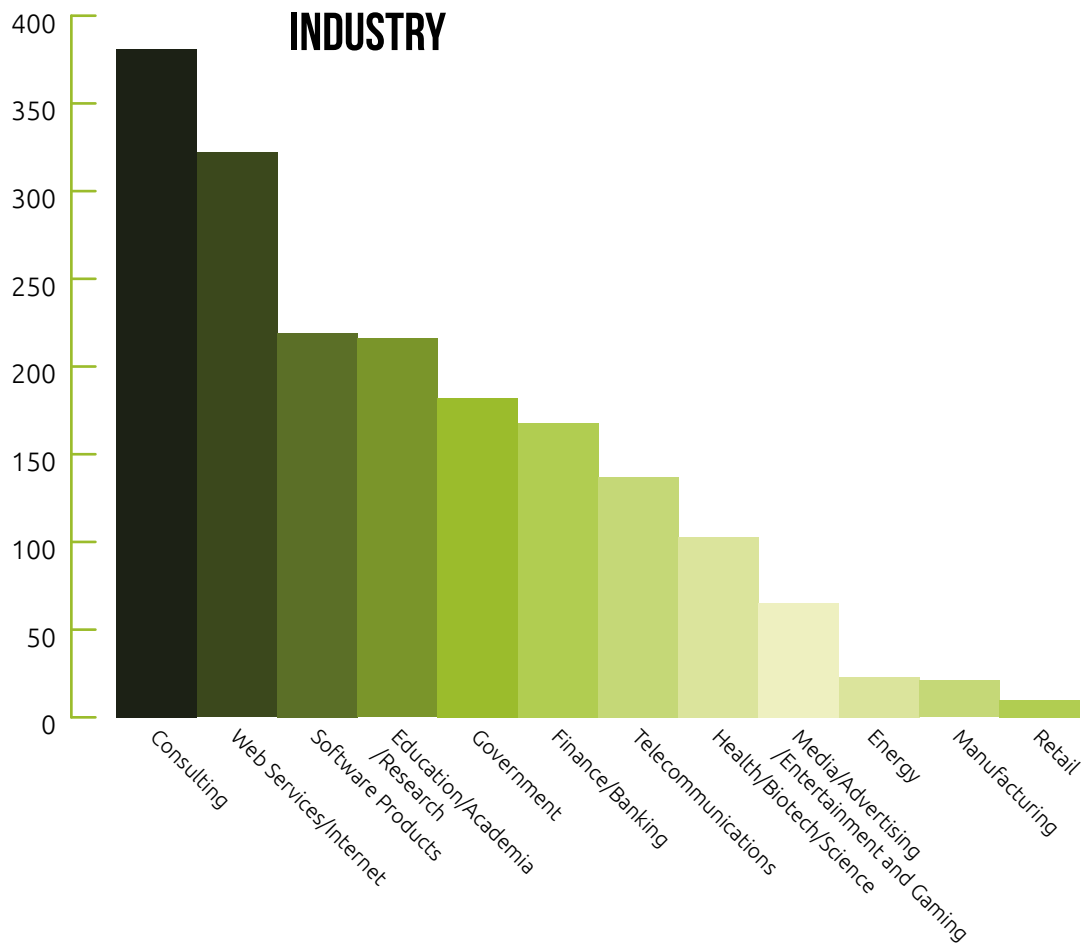
WHAT WERE THE DEMOGRAPHICS OF THE SURVEY?

RESPONDENTS BY COUNTRY

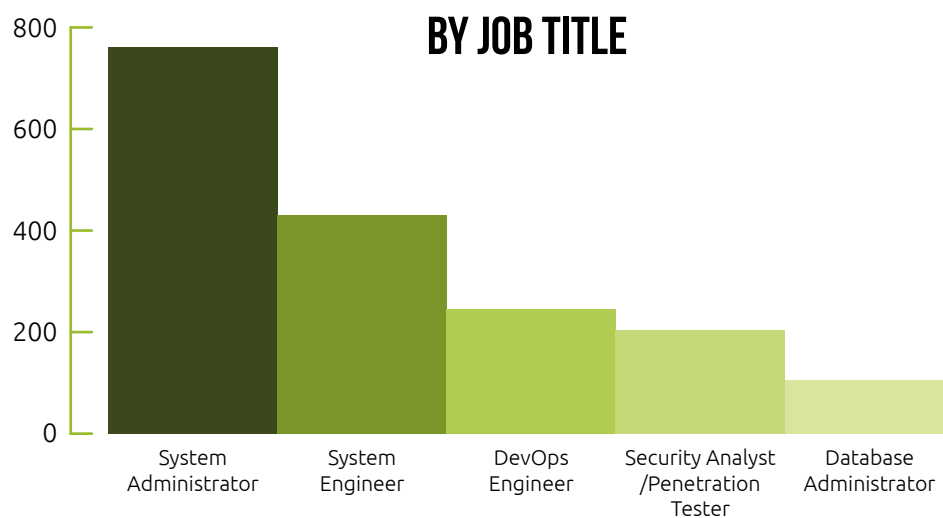


The world of Security and System Administration is filled with System administrators from a number of different industries and experience levels, and from

this combined wealth of knowledge we've discovered several interesting facts about certain industries that we'll look at in more detail.



This stream of our survey contained the most experienced people with an average of more than 15 years of experience, with a diverse range of roles represented across respondents:



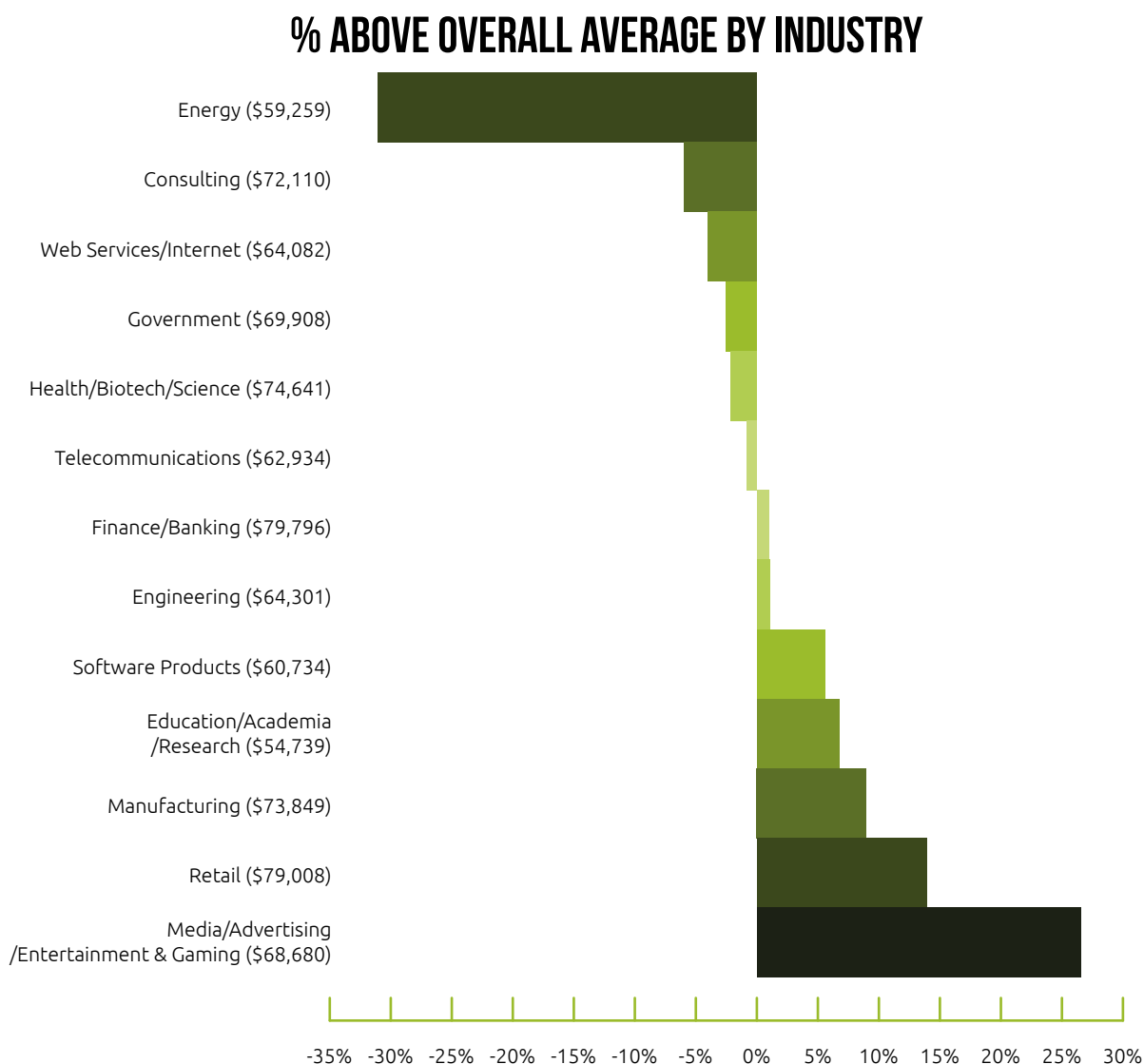
20% of our survey respondents work in IT security; the remaining 80% work in the broader category of IT administration, which contains four of the roles shown above.

WHICH INDUSTRIES PAY THE MOST?

With concerns around infrastructure and security becoming more prominent for almost all organizations, we wanted to find out if there was any area where these roles were particularly valuable, and in which areas

sysadmins are being paid the most.

This graph shows how sysadmin and security salaries compare against all categories within our Skill Up survey.



Media/Advertising/Entertainment and Gaming value administrative roles most highly. The salaries of respondents working in those areas were significantly over the industry average. This indicates just how important infrastructure is to organizations and the way in which they operate.

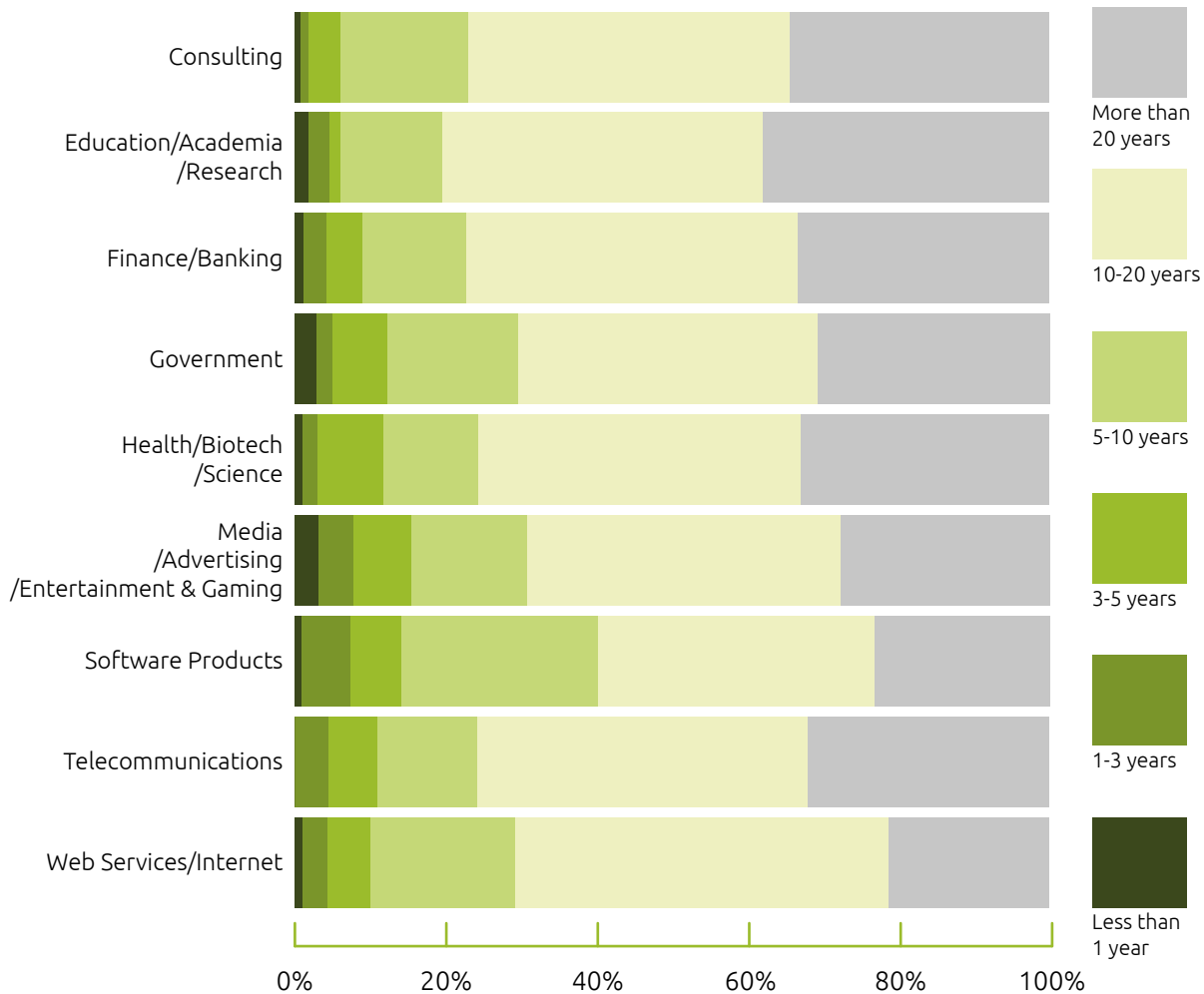
With the emphasis today on interaction and engagement externally, and agility and dynamism internally, it's not difficult to see

exactly why administrative-focused technical roles are so highly valued.

Typically, Media, Advertising, Entertainment and Retail, are all industries that have a real reputation for relatively poor pay. Clearly, however, having very skillful people who are able to manage, develop and improve infrastructure and processes at a technical level is worth investing in!

INDUSTRIES AND EXPERIENCE

How do different industries break down by experience? Looking at this will give us an insight into where people are entering employment and an indication of where there are most opportunities.



More respondents with less experience are working in Media/Advertising/Entertainment and Gaming than in any other industry. This indicates that these industries are looking to recruit young talent, possibly to support

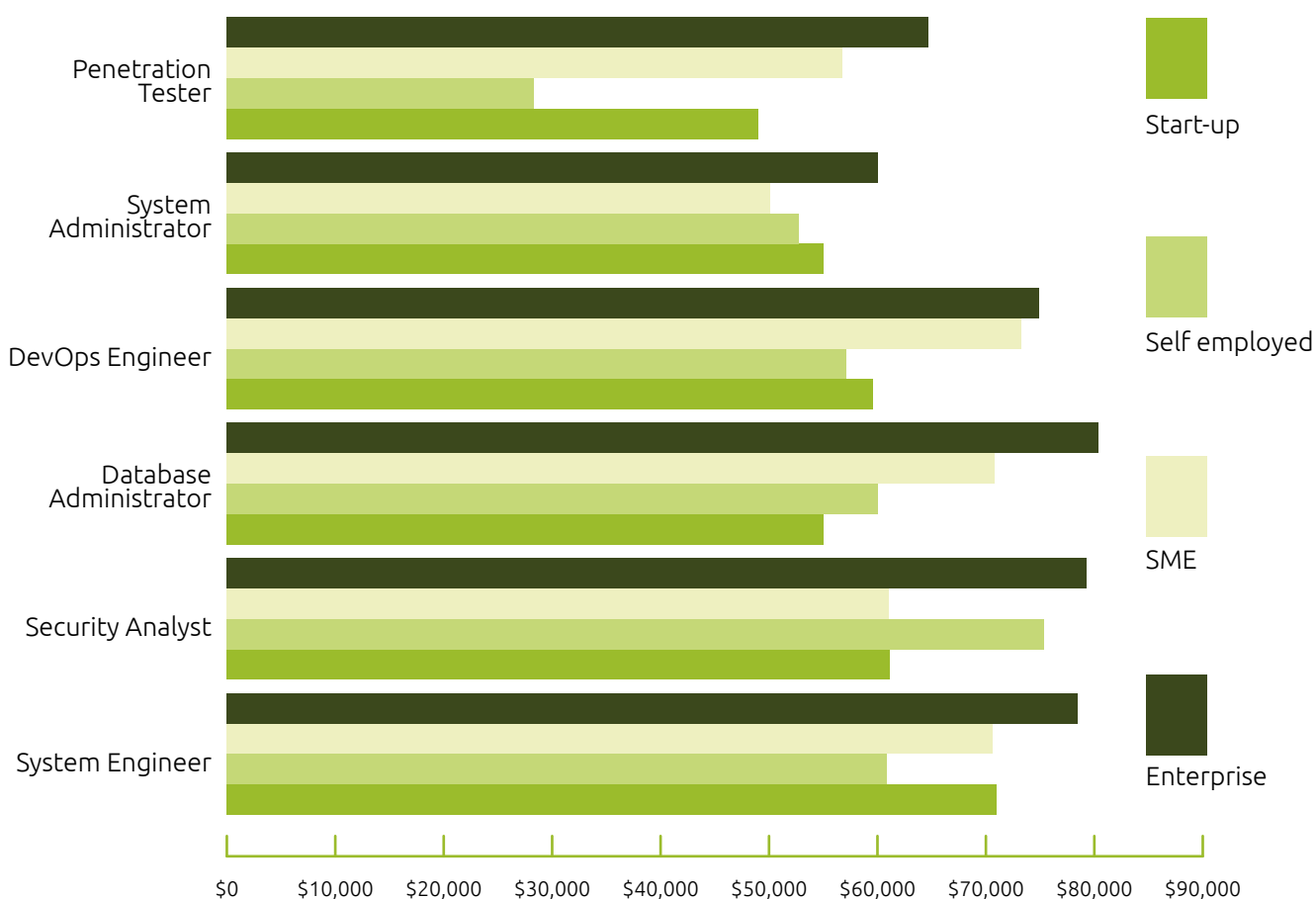
more experienced staff and grow their teams, but also to bring fresh perspectives to organizations eager to embrace change. Roles in these industries are a great place to start!

FROM START UPS TO ENTERPRISE: ADMINISTRATIVE ROLES IN DIFFERENT SIZE COMPANIES

Enterprise Database Administrators are earning the most, possibly due to the emphasis currently being placed on Big Data. Enterprise companies are investing a lot of money in Penetration Testers, which points to growing anxieties surrounding system security. Self-employed Security Analysts, who are likely

to be working as consultants, can and do command high salaries. DevOps Engineers working in SMEs are paid almost as much than at enterprise level.

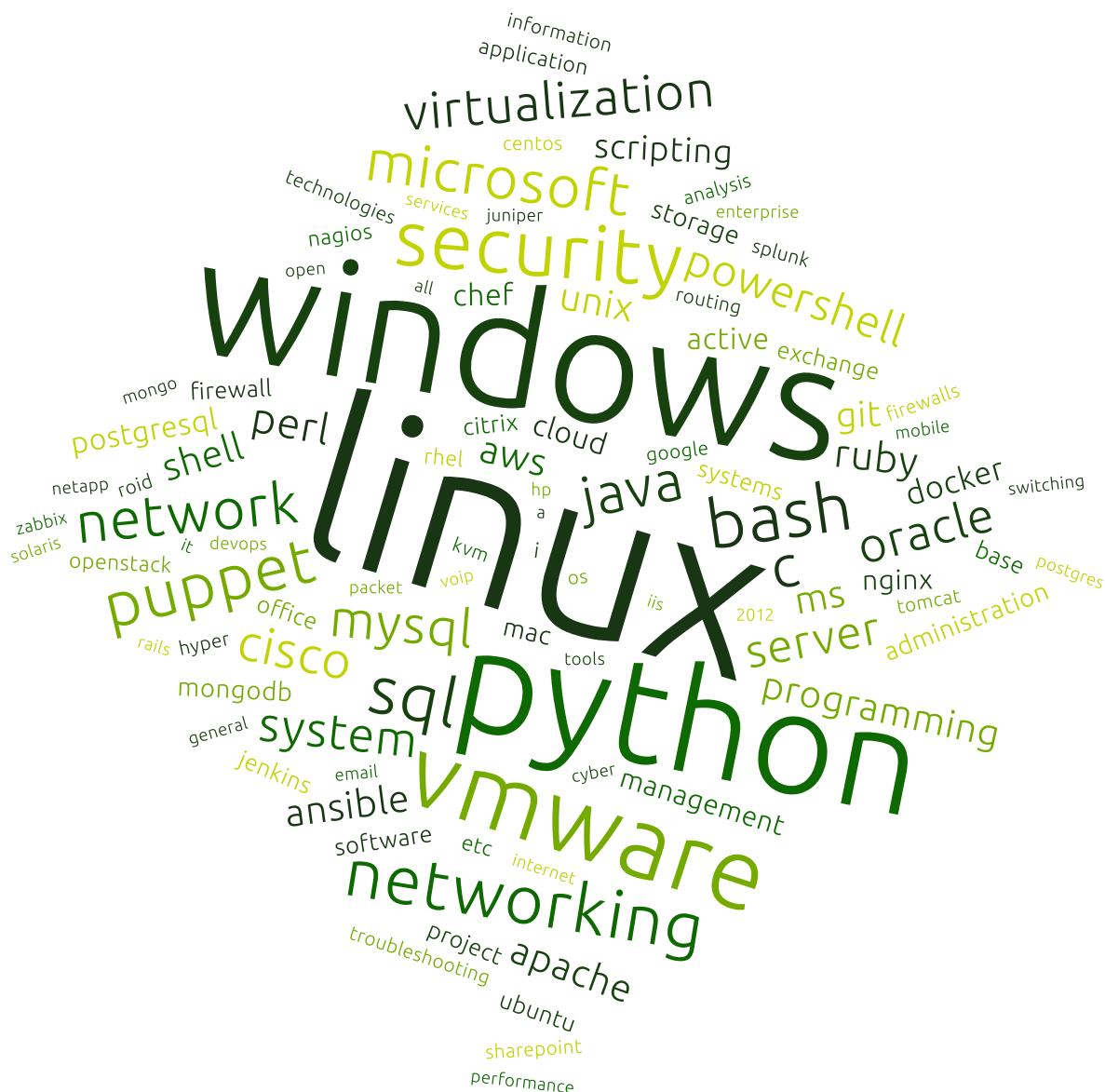
Let's look a little deeper into salaries by company type.



- Enterprise Database Administrators are paid the most. This is perhaps unsurprising given the dominance of Big Data at an enterprise level. Perhaps what we're seeing here is some crossover from administration to a more data-oriented role.
- Enterprise companies are investing money in Penetration Testers and Security Analysts, most of whom are likely to be working as consultants. Their experience is commanding a higher salary.
- The low salary of self-employed Penetration Testers suggests that penetration testing is something businesses want to do in-house. However for broader strategic insights and solutions, organizations are much keener to look externally. A great opportunity if you are thinking of making a change to your career or enhancing your skills.

We next looked at what areas our administrators and security experts are working in. Let's dig a little deeper to find out what tools they are using.

This tag cloud gives a broad overview of some of the most frequently used words given in response to our survey. It gives a clear indication of the breadth of tools used by respondents in this stream:



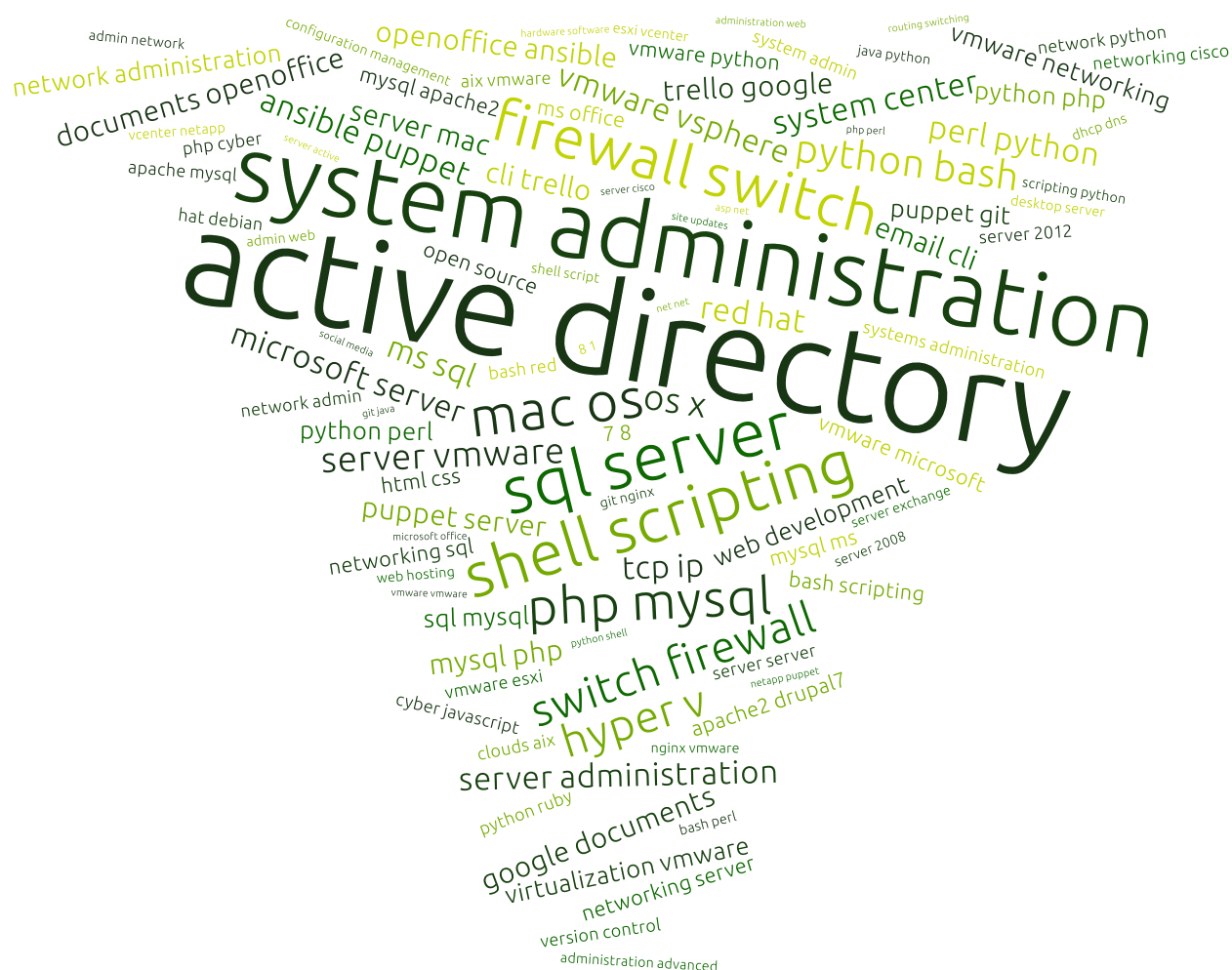
The two leading operating systems are most prominent here, but we can also see a wide range of tools for some very different tasks.

Let's go into more detail.

[illegible]

Python comes out on top, but also note the diverse tools referenced here. Kali Linux is evidently still a popular tool, as well as Metasploit and nMap, but the appearance of web based tools and languages also indicate exactly where security experts are focusing their attention.

SYSTEM ADMINISTRATORS / SYSTEM ENGINEERS



- Many enterprise products are being referenced here, Cisco, Citrix and VMware are all being used by a large number of system administrators and engineers.
- Interestingly a number of non-technical skills, such as 'coaching skills', 'change management' and 'project management', feature here. This indicates that those working in IT administrative roles are playing a key role in improving processes and driving change. These softer skills are quite different to the standard technical skills required for more traditional roles.
- 'Security' features in this tag cloud, suggesting a certain degree of crossover between administrative and security roles. Furthermore, this may indicate that stretched budgets and limited resources are leading many System Administrators and System Engineers to take on more responsibility for security issues.

We've now seen what skills respondents are currently using. We also want to know what tools they will be learning over the next six months.

These word clouds visualize the most frequent words in response to the question ‘What tools are you planning to learn in the next six months?’

SECURITY ANALYSTS & PENETRATION TESTERS



- 'Malware analysis' comes out top, so clearly those working in security are interested in exploring how malware operates at a very deep level.
- 'Threat modelling' also appears prominently, emphasizing the fact that those working in security are looking to learn new tools and approaches to combat additional challenges and security threats.
- The appearance of 'Big Data', 'mobile development' and 'cloud architecture' highlights the fact that these broad tech trends will have to be addressed by security experts, so new tools can be developed to increase security around technical infrastructures.

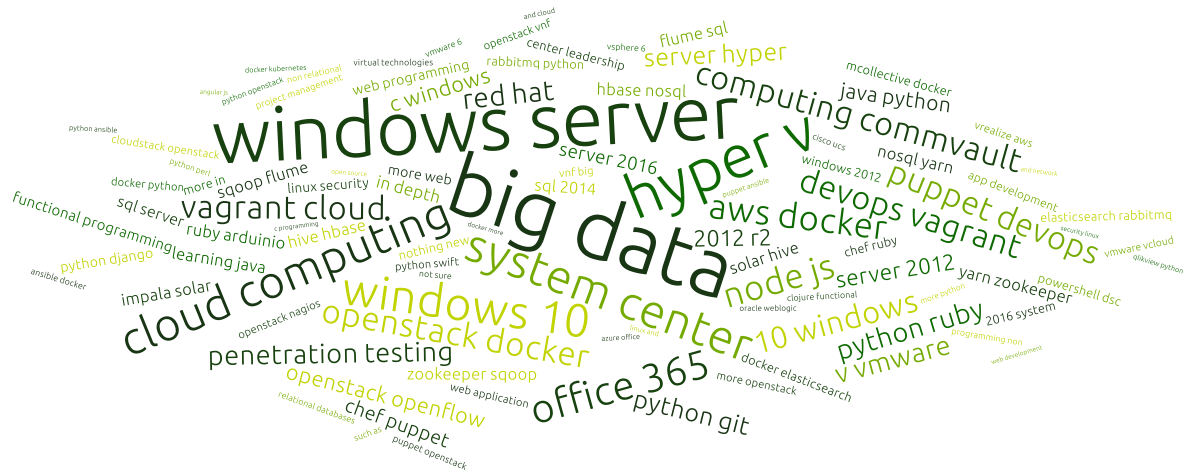
Want to learn any of these tools? This bundle has got you covered:

- [Kali Linux - Assuring Security by Penetration Testing](#)
- [Kali Linux Web App Testing \[Video\]](#)
- [Python Web Penetration Testing Cookbook](#)
- [Kali Linux: Wireless Penetration Testing Beginner's Guide, Second Edition](#)
- [Python Penetration Testing Essentials](#)

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SYSTEM ADMINISTRATORS/SYSTEM ENGINEERS



Microsoft products dominate the field when it comes to System Administrators/System Engineers' plans for learning over the coming months. Virtualization is a hot topic too. It's interesting to see that some of our respondents want to learn 'advanced Python', possibly an indication of the increasing prominence of data analysis and Big Data.

Once again, we can also see a number of references to non-technical skills such as 'project management' and the phrase 'communicate technically' further indicates the pressure placed on System Engineers to implement change and drive improvement through new tools.

Grab these guides and get ahead of the trend in the world of System Administration:

- [Puppet Cookbook - Third Edition](#)
- [Linux Shell Scripting Cookbook, Second Edition](#)
- [Learning OpenStack Networking \(Neutron\)](#)
- [Functional Python Programming](#)
- [Web Penetration Testing with Kali Linux](#)

THE SYSADMIN TOOLBOX



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CHALLENGES AND OPPORTUNITIES: EMERGING TRENDS FOR THE NEXT 12 MONTHS

As well as investigating what tools people are planning to learn, we also wanted to find out what they saw as the key trends likely to dominate their field over the course of the next 12 months.

This tag cloud visualizes their responses:



Dare we point it out? Cloud dominates here! This indicates that there is still a demand for new storage and collaboration solutions. Since Cloud has been around for a number of years already, whether it is an emerging technology can be argued. Is the renewed emphasis on Cloud migration related to finding effective solutions for new challenges in technology?

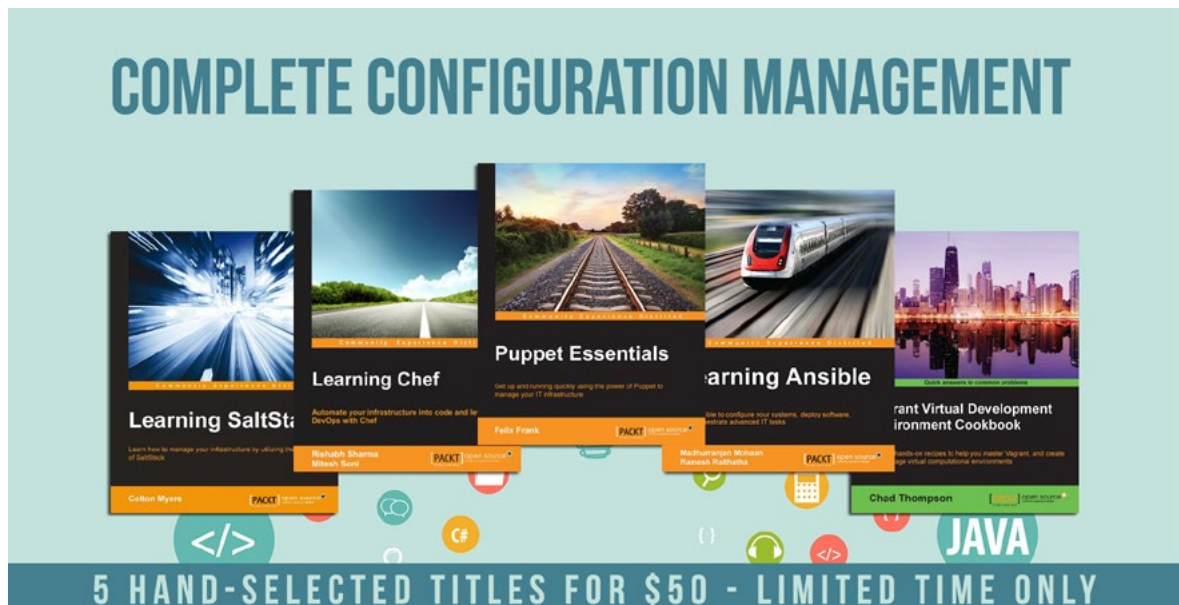
Containerization is also a very big topic – largely driven by Docker. Could this suggest that Docker is now so popular it has become a metonym for containerization?

Automation also appears prominently, along with a number of references to configuration management tools such as Ansible and

Puppet. Evidently solutions that allow System Administrators and System Engineers to simplify the way they manage their infrastructure will become more and more popular.

Dive into the world of Configuration Management with this bundle:

- [Puppet Essentials](#)
- [Learning Chef](#)
- [Learning Ansible](#)
- [Learning SaltStack](#)
- [Vagrant Virtual Development Environment Cookbook](#)



COMPLETE CONFIGURATION MANAGEMENT

Learning SaltStack
Colton Myers

Learning Chef
Shahab Shams
Mitesh Sene

Puppet Essentials
Felix Frank

Learning Ansible
Muthurajagan Mahesh
Rakesh Padhatha

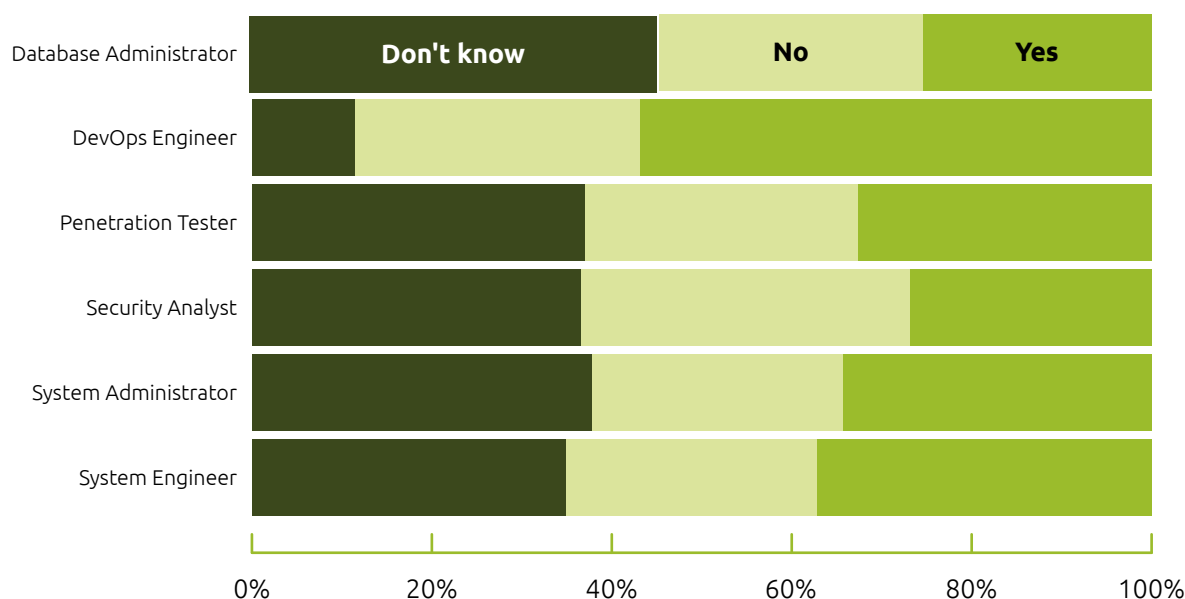
Vagrant Virtual Development Environment Cookbook
Chad Thompson

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HOT TOPIC ANALYSIS

We wanted to see how our respondents felt about some of the biggest issues and hottest topics in their field at the moment.

DO YOU SEE TOOLS SUCH AS VAGRANT AND DOCKER DISRUPTING THE WAY YOU WORK IN THE FUTURE?



Generally, there's a relatively even split. The obvious exception is DevOps Engineers for whom the answer is a much more resounding 'yes'.

It is interesting to note that even among DevOps Engineers, there is still a significant minority of respondents that said 'no', DevOps Engineers have a much clearer opinion on this issue, with very few responding 'don't know'!

Those that replied 'no' could have done so for a number of reasons.. As the question asks if it could disrupt 'the way you work', those DevOps Engineers who are already using Vagrant and

Docker, won't see it as a future challenge to their practices and methods.

Want to learn more about containerization? Don't miss this incredible bundle of top titles:

- [Orchestrating Docker](#)
- [Docker for Web Developers \[Video\]](#)
- [Build Your Own PaaS with Docker](#)
- [Docker Cookbook](#)
- [CoreOS Essentials](#)

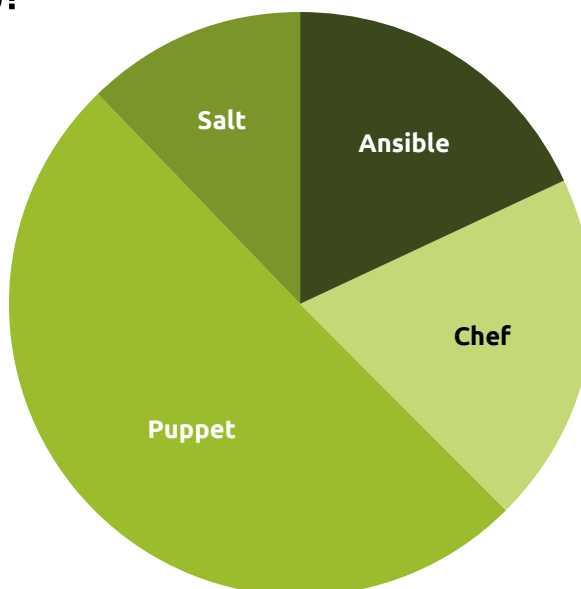
EASY CONTAINERIZATION



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CONFIGURATION MANAGEMENT TOOLS

WHO HAS WON THE WAR ON CONFIGURATION MANAGEMENT OUT OF THE FOLLOWING TOOLS?

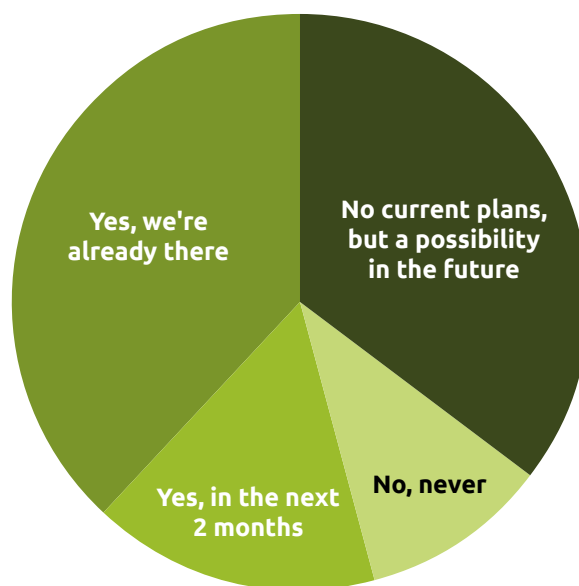


- Puppet dominates the field when it comes to Configuration Management. Its established popularity has been growing, with its large installation and developer base likely to consolidate its position as the most popular CM tool.
- Chef, which makes use of Ruby, is a general-purpose language that certainly isn't that intuitive or easy

to learn. Nor is it specifically built for the challenges of configuration management.

- It will be interesting to see how Salt, Chef and Ansible develop over the next year or so and what new features they implement to tackle Puppet's dominance.

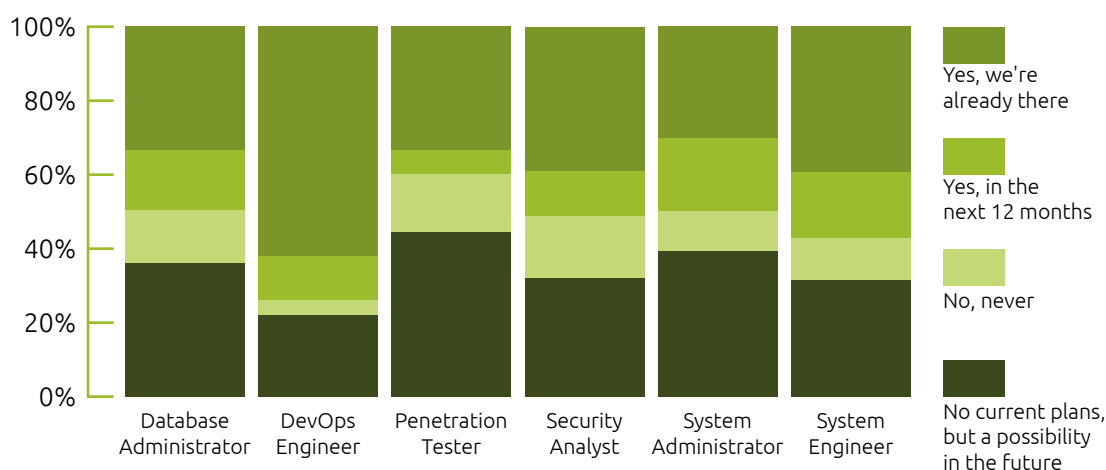
IS YOUR COMPANY CONSIDERING MOVING TO A CLOUD-BASED INFRASTRUCTURE?



A distinct majority of companies already have, or are planning to move to a cloud-based infrastructure. A combination of resourcing issues and the need for flexibility and agility, more remote working and bring your own

device (BYOD) may well be driving this trend, suggesting Cloud will become standard over the next few years.

Looking at this question in more detail, what were the responses by job title?

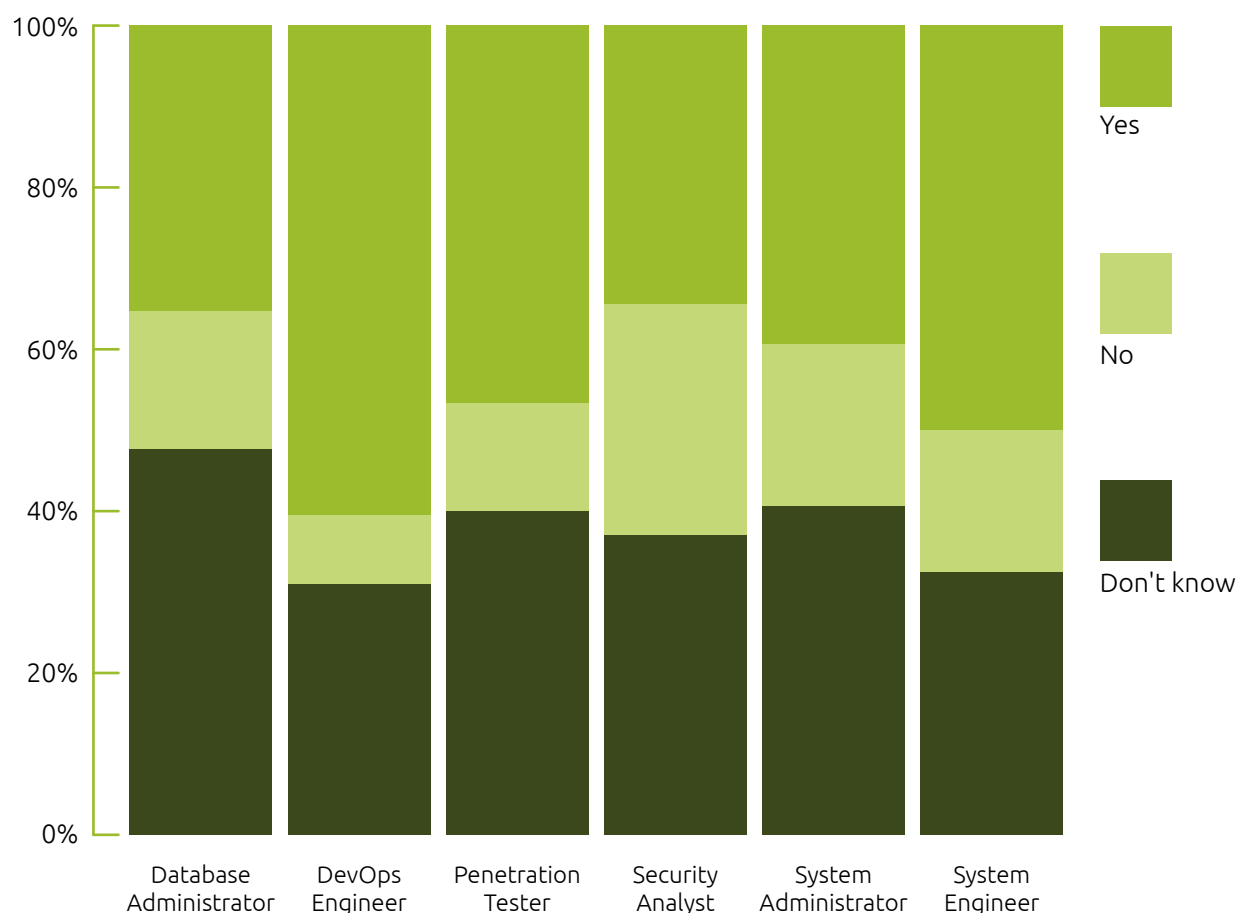


- Almost 75% of companies that implement DevOps practices have already, or are planning to move to the Cloud.

It could be argued that you can't utilize DevOps effectively unless you are using the Cloud.

The question of whether you need DevOps to make full use of Cloud technology is another conversation! It is likely that we will continue to see a movement towards more collaborative ways of working over the next few years, if not explicitly driven by DevOps, then certainly inspired by its philosophy.

IS THE RISE OF THE 'X AS A SERVICE' TREND A GOOD THING FOR SYSTEM ADMINISTRATORS?

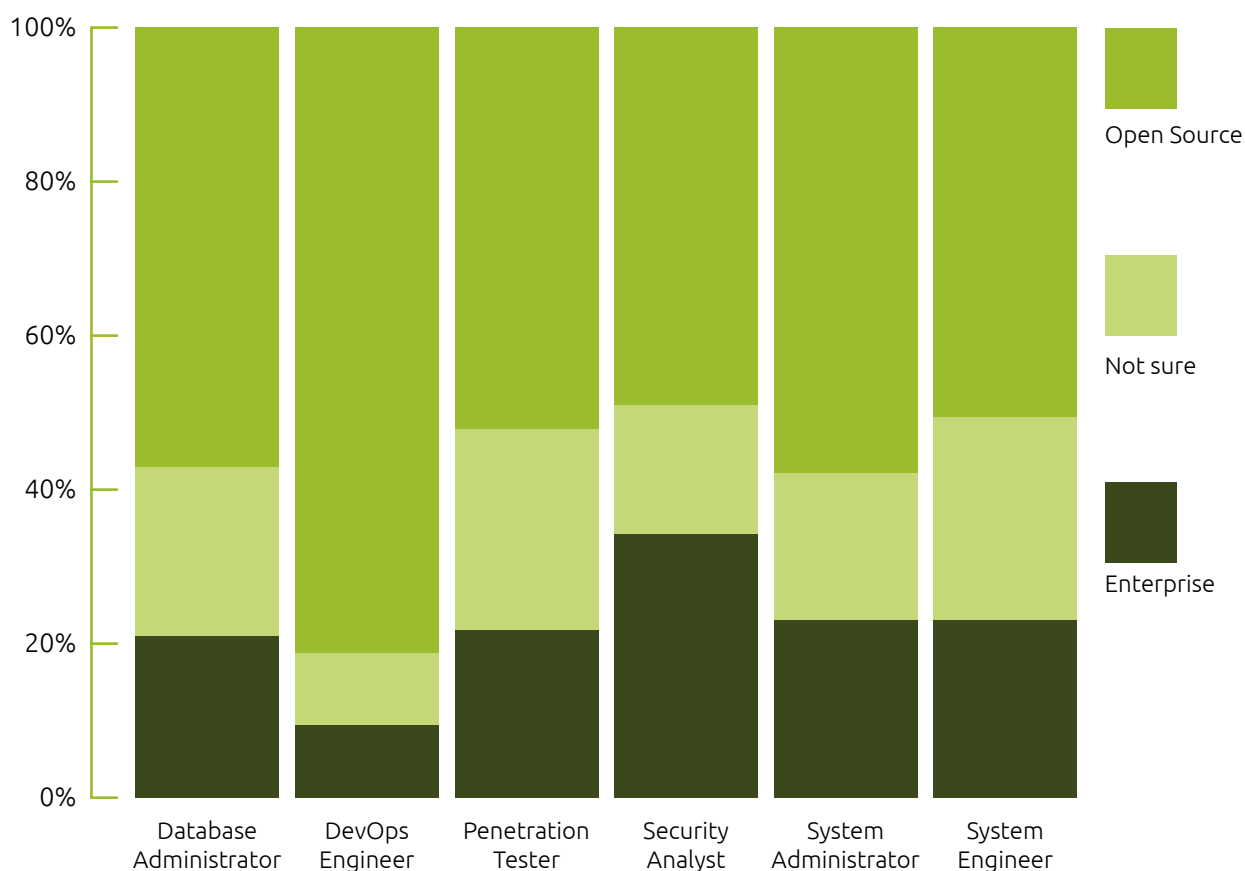


- There is no clear consensus on this issue with just under 40% of System Administrators agreeing with the statement, and just over 40% not sure.
- DevOps Engineers were not backwards in coming forwards here! Referring back to the topic of Cloud in relation to DevOps practices, it's not difficult to see why DevOps engineers would be so positive about XaaS, given its dependence upon Cloud.
- The Security Analysts' response was in contrast to the DevOps Engineers. 30% of respondents didn't think XaaS would be good for System Administrators,

more than any other group (including sysadmins themselves)! Added security pressures that come with Cloud and XaaS technologies and Cloud security concerns have underlined the potential dangers of housing data in an external resource.

It may not simply be the case that Security Analysts believe XaaS to be particularly vulnerable (although there might well be some truth in that), but they might also perceive the System Administrator role as being further burdened by security concerns as the XaaS trend increases.

DOES THE FUTURE OF VIRTUALIZATION LIE IN OPEN SOURCE OR ENTERPRISE TECHNOLOGIES?



Broadly, there is a consensus that the future of virtualization lies with Open Source tools. Clearly, however, DevOps Engineers are the most convinced by Open Source. This is unsurprising given the fact that Open Source affords a lot more opportunities for customization and experimentation, key elements in the DevOps philosophy.

Echoing the earlier contrast, Security Analysts (the group with the highest proportion

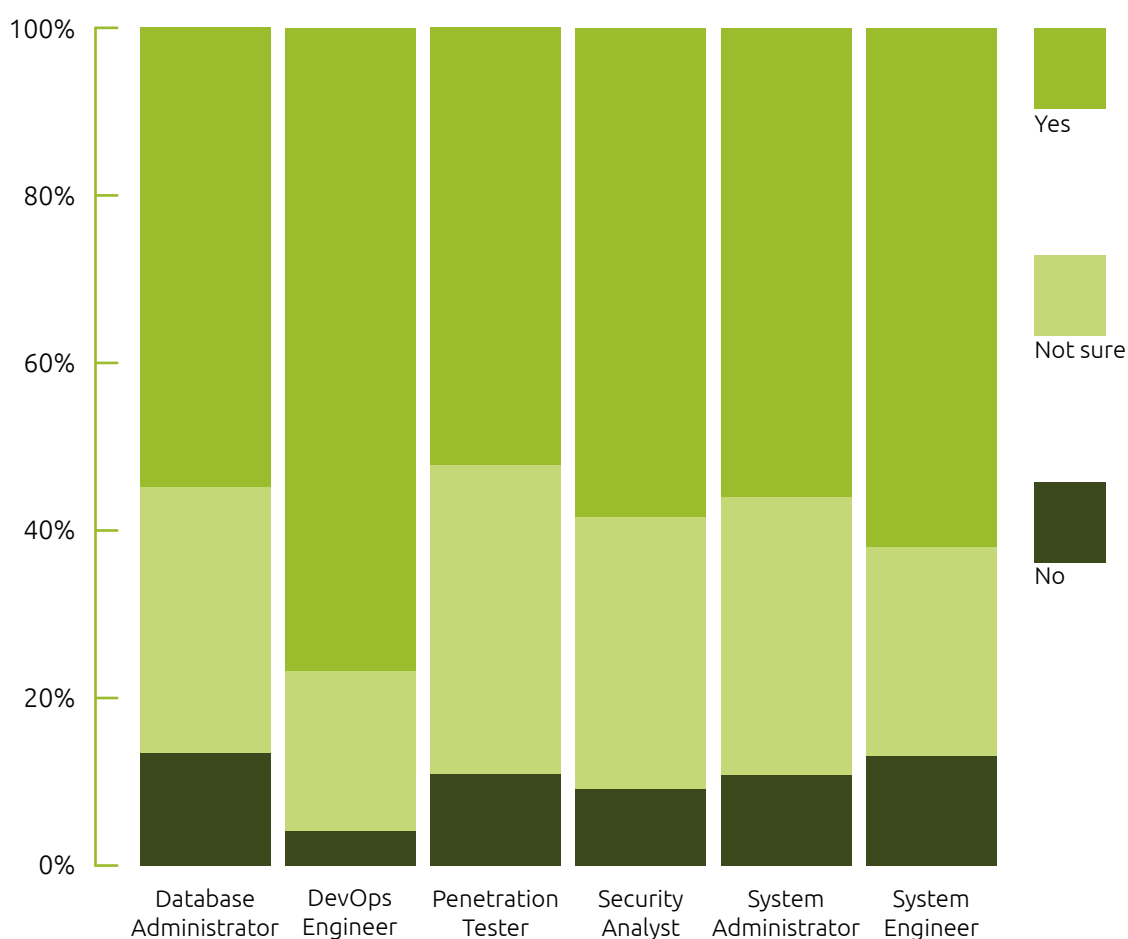
of respondents) believe the future of virtualization lies with Enterprise tools. Although the majority of Security Analysts thought Open Source was likely to be the future, the fact that the most significant minority of respondents in favor of Enterprise were Security Analysts suggests, in relation to Open Source, they are a skeptical bunch!

HOT TOPICS: DEVOPS

As our research has indicated throughout this report, DevOps is a trend that appears to have a wide and almost disruptive influence on the way in which we understand and manage IT infrastructures.

To get a sense of how DevOps fits into the overall picture of system administration, we asked our respondents this question:

DO YOU SEE THE NUMBER OF DEVOPS ENGINEERS INCREASING IN THE NEXT 12 MONTHS?



Although there is an obvious bias from DevOps Engineers, respondents from all roles believe there will be an increase in DevOps roles over the next year.

Given that DevOps is perceived to be such an important trend, we looked more closely at exactly who is working in DevOps now.

- Puppet dominates as the go-to Configuration Management tool.
- Python also dominates as the key language. It is difficult to say if there's anything specific about Python for DevOps Engineers. It's certainly popular, and its flexibility makes it an obvious choice for a DevOps Engineer working in a very multi-faceted role.
- What's most significant here is the diversity of tools on display, which emphasizes the diversity of the DevOps role.

The presence of tools like Unicorn, JBoss/Wildfly and other server tools suggests a tendency for DevOps engineers to develop their own applications for their work, and indicates a move towards a certain degree of

technical 'self-sufficiency'.

The presence of many diverse NoSQL data handling technologies (MongoDB, Redis, Elasticsearch, etc) suggests these are the types of tools DevOps Engineers would use to tackle data.

Dive into the world of DevOps with our hand-picked selection of titles:

- [Continuous Delivery and DevOps: A Quickstart Guide - Second Edition](#)
- [Mastering Python \[Video\]](#)
- [Mastering Git \[Video\]](#)
- [Mastering Puppet](#)
- [Jenkins Continuous Integration Cookbook - Second Edition](#)

DEDICATED DEVOPS



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What's also interesting are the skills we see when we use a tag cloud to visualize the results.

We don't see quite so many tools and technologies, but we can see the non-technical skills that are essential for DevOps Engineers:

'People skills' and 'technical leadership' stand out here, demonstrating the unique position of DevOps Engineers within their organizations. Their work exceeds the purely technical. If we are going to see an increase in the number of DevOps Engineers over the next 12 months, as many of our respondents believe, then it will become crucial to cultivate these skills, which are, arguably, even more difficult to develop than purely technical knowledge.



We've now seen what DevOps Engineers are using. We also looked at what they wanted to learn:

- 'More Python!' is the message here, a testament to the extensive capabilities of the language and the fact that, as mentioned earlier, it can be used for such a huge range of tasks.
- ID Management also presents another interesting challenge to DevOps Engineers – this might be an emerging solution to the general trend towards increased collaboration and more open ways of working within and across teams.
- It's also interesting to see the presence of 'Big Data' and 'Machine Learning' here. This suggests an increasing emphasis on using some data science techniques in every day DevOps practices, as well as a move towards new ways of delivering business intelligence and data insights to improve strategic decision-making.



SUMMARY

The presence of DevOps has been large in our results – and underpins a transformation in the way infrastructure is understood and managed in organizations. Reliability and security are still essential, and Enterprise tools still dominate the world of System Administration. However, there is an increasing need for agile solutions that can improve processes and make organizations more dynamic, particularly

in fast-changing areas of the economy. It's not just DevOps that's important here – we've seen that Data Architects have a very distinct value too, demonstrating that it's not simply about a label or a philosophy, but is more specifically about an ability to develop and implement solutions.

WHAT YOU NEED TO DO NEXT...

- Learn more languages. We've seen that the most successful people in this field are polyglots, capable of using a wide range of languages.
- If you don't fancy learning a new language, learn more Python!
- If you're in security, make sure you're up to speed with the latest Penetration Testing techniques. As security concerns become more and more prominent, it's a comprehensive way of identifying and then eradicating vulnerabilities in your systems.
- Embrace automation. Configuration management tools are your friend! Take the time to master automation, so you can start focusing on other areas of optimization and improvement.
- Make sure you're up to speed with Docker and containerization.
- Start thinking strategically. Being able to implement new tools and drive improvement programs is where the real value is for anyone working with IT infrastructures. To do this you're going to need to learn how to effectively manage and lead others.

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As part of our mission, we have also awarded over \$1,000,000 through our Open Source Project Royalty scheme, helping numerous projects become household names along the way.

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